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Lubrication

A Technical Publication Devoted to the Selection and Use of Lubricants

THIS ISSUE

EXTERNAL LUBRICATION of Engines and Compressors

CHASSIS LUBRICATION METHODS

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External Lubrication of Engines and Compressors

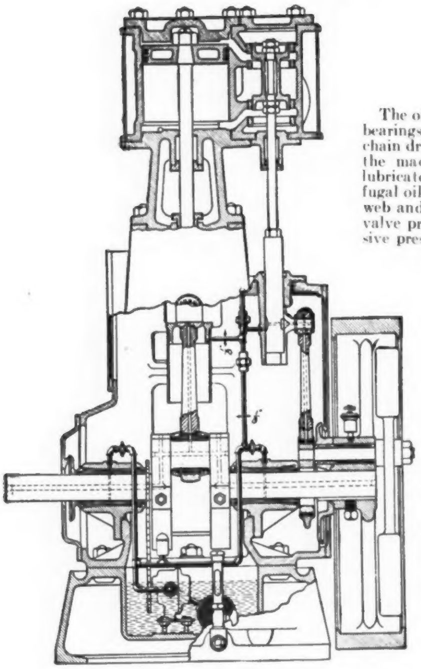
IN TWO former issues of this magazine the problems involved in the lubrication of the cylinders of engines* and compressors† were analyzed. The lubrication of the external bearings will now be considered. By the general word "bearings" is understood not only the main and crankpin bearings but also the cross-head and guide, eccentrics, governor, etc. In general, there are two methods of lubricating these bearings, namely, by drip cups or by some form of continuous oiling system. A number of oiling systems are in use but they can be divided into two classes: those using splash lubrication and those using some form of pressure distribution. The relative advantage of one method over another depends largely on the size and speed of the unit and the quantity of oil that is required to be distributed. In many cases the determining factor is simply the preference of the manufacturer.

Drip Cups

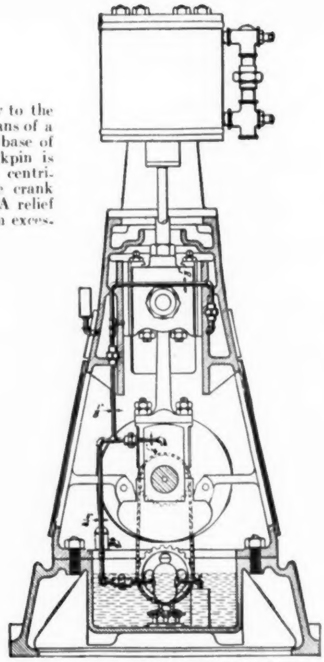
Most of the older types of engines, especially in the small sizes, are equipped with drip cups either throughout or in all places except the main bearings where ring oil systems may be preferred. These drip cups are usually individual, being placed as near as possible to the point that it is desired to lubricate. If the oil can not drip directly onto a bearing surface it may be led to this surface by a short pipe, or wipers may be placed on the moving parts in order to pick up the oil properly. In some installations it is possible to place these cups in gangs so that a number can be fed from the same reservoir, either by drip tubes or wicks. Under this system the oil is usually carried to crankpins by centrifugal oilers or the so-called "banjo" arrangement.

This type of lubrication is quite intermittent in character but has some advantages over continuous systems. If properly adjusted, it is simple in operation and just the right amount can be fed so as to afford sufficient lubrication and allow little waste. As used in practice, however, there is considerable waste and the used oil is not generally saved or reclaimed. This system of bearing lubrication generally requires an oil of 200″ to 300″ Saybolt Viscosity at 100° F. but in the case of the guides some operators use an oil of higher viscosity in order to produce smooth running of normally loose parts. This higher viscosity oil, however, is not recommended for bearings as it will cause them to heat abnormally and use up power. On long stroke engines it is sometimes necessary to use a cylinder oil or even a grease on the guides in order to prevent splashing, though the frictional heat is increased thereby. In most cases where either pure cylinder oil or cylinder oil mixed with engine oil is used, a lighter oil could be used if the slipping

*June, 1921 †June, 1920.



The oil is forced directly to the bearings and slides by means of a chain driven pump in the base of the machine. The crankpin is lubricated by means of a centrifugal oiler inserted in the crank web and counterweight. A relief valve prevents injury from excessive pressure.



Courtesy of the B. F. Sturtevant Co.

Fig. 1

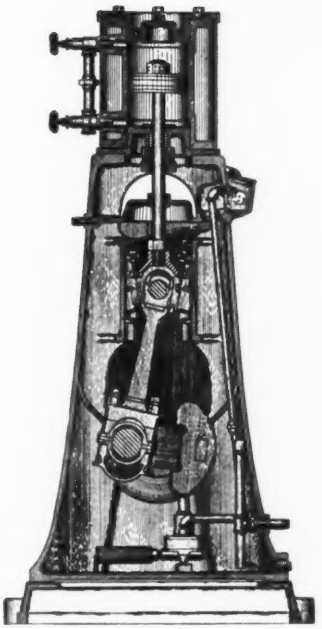
surfaces were properly trued up and supplied with correct grooving. As a general rule oil grooving is not recommended for high speed bearings, especially if the engine is reversing. With low speed bearings, however, especially those of large dimensions, some sort of oil grooving is necessary in order to distribute the oil evenly over the bearing surface. Oil grooves should lead from the points on the bearing where the pressure is lowest and not lead through points of high pressure. Chamfering at the edges of the grooves where the oil enters between the slipping surfaces, assists materially in producing proper distribution of the oil and the maintenance of a film.

Continuous Oiling Systems

Continuous oiling systems operate on the opposite theory to the drip cup; that is, they supply to the bearings a large excess of oil over that which is absolutely necessary for lubrication. The oil acts not only as a lubricant but as a cooling medium by carrying away the frictional heat of the bearing and reducing the running temperature. It also keeps the bearing surfaces washed clean of dust and small particles of worn metals, and by removing these abrasive substances reduces the bearing wear to a minimum. When proper means are provided for collecting the oil and cleaning it of its impurities after it has passed through the bearings, these systems may be operated on a fairly small consumption of lubricating oil. With the larger engines which require a considerable quantity of oil, the circulating systems often contain highly developed filtering units, together with various reservoirs, drain tanks, cooling tanks, etc. The smaller units, particularly the high speed engines, usually have the crankcase and crosshead completely enclosed to prevent the throwing of oil due to the high speed. On such units either the splash oiling system or the forced feed system may be used. Both types are used satisfactorily in service and the question is still open as to the final advantage of one over the other.

Forced Feed Lubrication

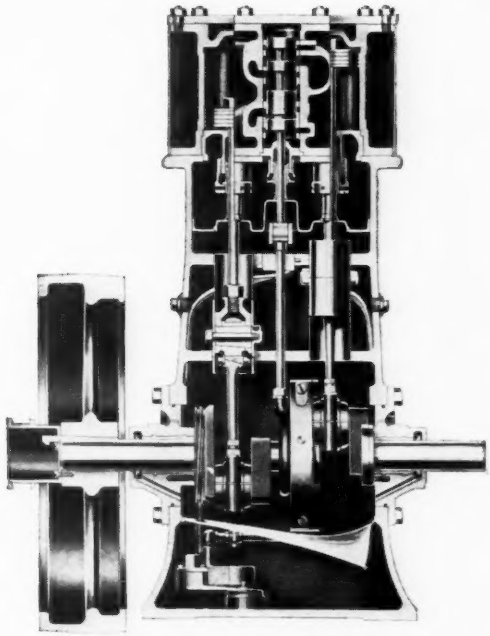
In the forced feed system the oil is forced into the bearings at pressures ranging from 5 to 15 lbs. per square inch. This may be done by pumps or by means of tanks elevated sufficiently above the bearings as to produce



Courtesy of Clarage Fan Company

Fig. 2

The oil is forced up, by means of a gear driven pump, through a pipe along the inside of the frame, and spouted out into the sight oil chamber on the side of the frame where the flow is easily seen. From this chamber the oil flows into a tray from which it is distributed to the various working parts of the engine. The cross-head pin is lubricated by a stream of oil flowing into a groove on the top of the crosshead. The main bearings are lubricated by means of oil flowing down the side and lead by ribs to these bearings. The crankpin is lubricated by means of a groove on the face of the crankarm from which a hole is drilled through to the pin, the oil being fed by centrifugal force.



Courtesy of the American Blower Co.

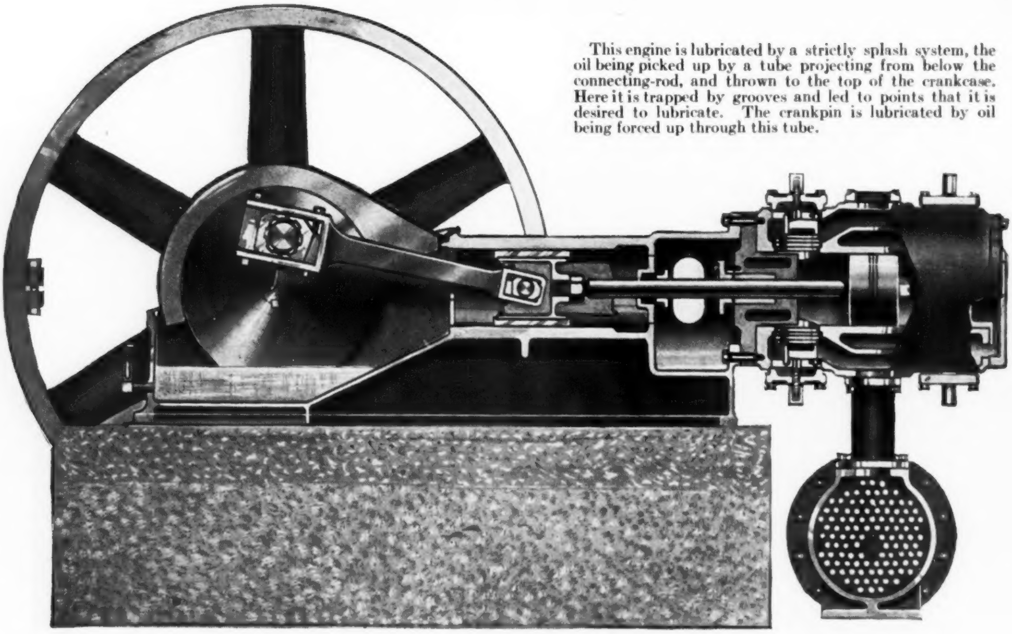
Fig. 3

In this system the oil is floated in the bottom of the crankpit on a small quantity of water. The oil is drawn through a strainer and forced, by means of a geared pump, through a sight feed glass into an oil basin at the top of the frame. From here it is lead by a number of tubes to the various parts to be lubricated. The cross-head pin is lubricated by oil dripping into a pocket placed at its end. The crankpin is lubricated by oil caught in grooves on the sides of the bronze gear and the crankarm.

a gravity head corresponding to the required pressure. The oil which flows through and over the bearings, and over the cross-head surfaces, is collected in a sump in the base of the machine or adjacent to it. From here the oil is pumped back through the circuit or to the gravity tank. There are several ways of distributing the oil. In some methods a separate pipe leads to each point that it is desired to lubricate. In many systems the oil is forced into the main bearing and thence through oil passages drilled in the crankshaft, to the crankpin and to the cross-head pin. In a number of systems the crankpin is lubricated by an oil ring attached to the crank-cheek. This is supplied with oil by a pipe from the pump or dips into the oil in the crankcase. It is so constructed that the oil thrown out by centrifugal force is held by the ring and led to the crankpin.

There are several types of pumps used in forcing the oil around the system. Some manufacturers use a pump geared to the shaft and placed in the base of the engine, drawing the oil from the sump. Another manufacturer uses a rotary pump entirely submerged in the oil and driven by a chain from the main shaft. In other cases the pump may be a separate unit with only a pipe connection to the sump. Care should be taken in the placing of the intake of the pump to have it sufficiently above any possible water line level. If water is drawn into the pump at the same time as the oil, bad emulsions will probably be formed, which will result in faulty lubrication.

Practically all systems use some sort of a filter. The small units use only a strainer fitted with fine gauze but arranged in duplicate so that one unit may be cleaned while the other is operating. In other systems the oil is passed through one or more layers of cloth in order to free it from impurities. Besides the filters some form of separator is generally used to remove the bulk of the water before passing the oil through the filter. This



This engine is lubricated by a strictly splash system, the oil being picked up by a tube projecting from below the connecting-rod, and thrown to the top of the crankcase. Here it is trapped by grooves and led to points that it is desired to lubricate. The crankpin is lubricated by oil being forced up through this tube.

Courtesy of the Worthington Pump & Machinery Corporation

Fig. 4

is generally done by allowing the water to collect in the lower part of the sump, and draining it off at regular intervals. Automatic drains can be arranged so that the water never reaches the level of the intake of the pump.

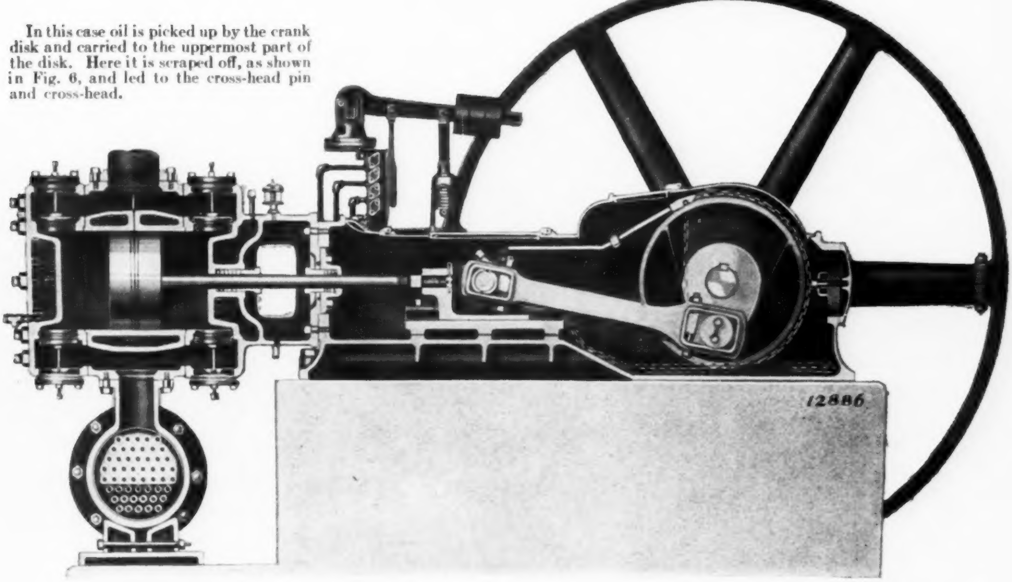
Splash Lubrication

This type of lubrication can be applied only where the crankcase is totally enclosed with oil tight covers. In general, splash systems have some means of picking the oil up in the crankpit of the machine and throwing it above any of the points that it is desired to lubricate. The oil thrown up into the case is picked up by troughs and oil grooves in the frame, from whence it is led to the bearings, cross head, governor parts, etc., by means of pipes or grooves. The excess returns to the crankpit for further use. As long as an ample supply of oil is maintained in the crankpit the bearings will not run dry unless the troughs or oil ways become stopped up. In splash lubrication care must be taken to have some sort of a baffle to prevent the engine oil from splashing against the hot cylinder wall, as the effect will be not only to heat the oil abnormally but to cause it to deteriorate on account of this sudden intense heating.

Forced Feed vs. Splash Lubrication

The splash system of lubrication has the advantage of simplicity and, having fewer parts, it requires less attention than the forced feed system. Both systems supply a flood of oil which washes out the dirt and worn particles of metal from the bearings, keeping them clean and properly lubricated. Owing to the fact, however, that in the splash system the oil does not leave the crankcase, there is little chance for radiation of heat taken up from the bearing and conducted in from the steam cylinder, and the oil will become warm. With the forced feed system the pumping of the oil through outside pipes and filters causes it to cool. This is particularly true where a reservoir is installed away from the engine, which allows the oil to come to rest for a short time. Cooling coils can be used in both systems but they are more easily applied to the forced feed system. There is an advantage in the forced feed system that sight feed cups can be applied and the operator is always cognizant of whether his bearing is receiving sufficient oil or not.

In this case oil is picked up by the crank disk and carried to the uppermost part of the disk. Here it is scraped off, as shown in Fig. 6, and led to the cross-head pin and cross-head.



Courtesy of Ingersoll-Rand Company

Fig. 5.

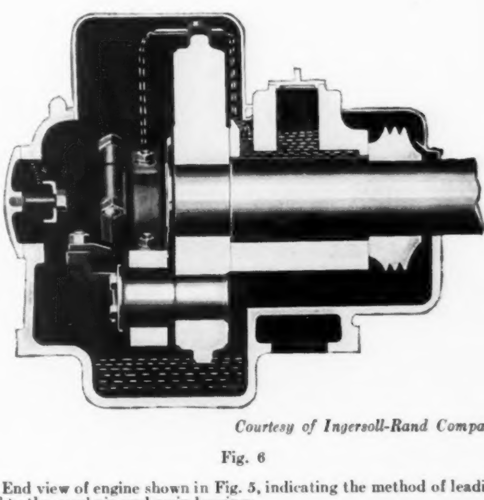
Another advantage claimed by forced feed advocates is that the oil is less churned up with the water by this system than with the splash system. This, however, has little significance if the proper oil is used in either system.

Water Conditions

The "bugbear" of both systems is the fact that it is impossible to keep water from mixing with the oil. This water is carried out from the steam cylinder on the piston rod and works its way into the oil, particularly in the case of vertical engines. Attempts are made to prevent this mixing by means of baffle plates, scrapers and secondary stuffing boxes placed around the piston rod near the cylinder. These serve the double purpose of preventing the engine oil from getting into the cylinder and the water getting into the engine oil, but the separation is never perfect. The water drained from beyond the baffle plate always contains some oil, and some water always gets into the engine oil. This requires that means for draining off the water from the bottom of the crankcase should be provided, and if not automatic, close attention must be paid by the operator to see that the water level does not get too high, so that oil is forced out through the main bearings or water is splashed up instead of oil.

Oil Characteristics

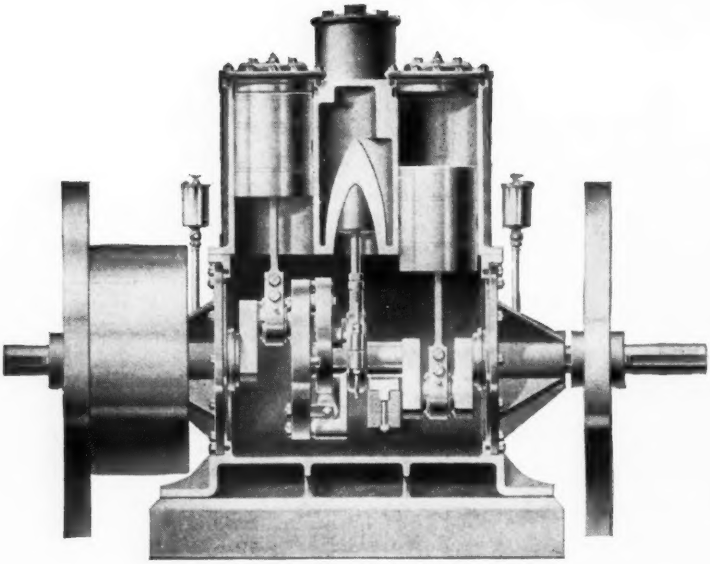
The proper oil to use in both forced feed and splash lubrication as described above is one that will separate readily from water and is most highly refined. Usually an oil with a viscosity of 180–200″ Saybolt viscosity at 100° F. will have sufficient body to afford satisfactory lubrication. In some engines, however, on account of loose bearings, it may be necessary to use an oil of 300″ or even 500″ viscosity.

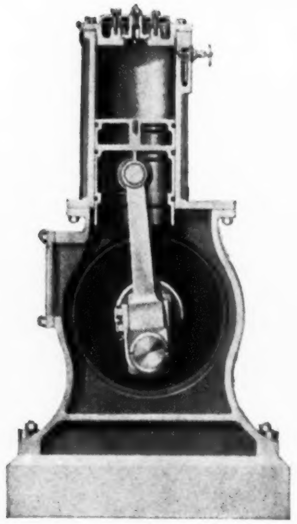


Courtesy of Ingersoll-Rand Company

Fig. 6

End view of engine shown in Fig. 5, indicating the method of leading oil to the crankpin and main bearings.





Courtesy of Westinghouse Electric & Mfg. Co.

Fig. 7

Section of Westinghouse engine using the splash feed system, in which a small quantity of fairly viscous oil is floated on a large quantity of water.

Splash Lubrication (Westinghouse)

This type of lubricating system not only does not aim to keep out the water but uses the water as a carrier of the oil. In these engines the oil in the crankcase not only lubricates the bearings but also lubricates the cylinder walls, though it is generally found advisable to supply some oil with the steam. These engines are usually single acting, with trunk pistons, but may be compound. The system consists in carrying a thin film of oil on the surface of a body of water in the bottom of the crankcase. The crank disk dipping in this mixture throws the oil and water up onto the cylinder walls and around the inside of the crankcase, from whence it drips to the bearings. The main bearings are usually lubricated from a separate sight feed cup, the excess oil draining into the crankcase. The oil for this engine must be heavier bodied than for the other splash feed types mentioned above on account of the fact that it must lubricate the cylinder walls as well as the bearings. This requires an oil having at least 100″ viscosity at 210° F. It must also separate quite freely from water and have adhesive characteristics which will cause it to cling to the cylinder walls even in the presence of water. While a slight emulsion will do no harm, the continual beating of the oil and water in the base is apt to form thick emulsions and render the lubricating system inoperative.

Conclusion

In all types of forced feed and splash systems where water is encountered particular attention must be paid to demand an oil which will separate freely from water and is highly refined to meet the conditions. While cylinder stock is necessary in the lubrication of the Westinghouse type of engine, in those types where only the bearings are being lubricated with these systems cylinder stocks should be prohibited. If the engine does not run smoothly without the use of these heavier oils the fault is with the engine and not with the lubricant, and it should be overhauled to bring it up to its best operating efficiency. In cleaning an engine care should be taken not to use waste; always use lintless cloths. The fine lint from waste cannot be prevented from clinging to the sharp corners and rough surfaces and will ultimately clog the filters and work itself into the bearings.

Chassis Lubrication Methods

An interesting explanation for the average car owner's negligence of chassis lubrition was offered at a recent meeting of the Society of Automotive Engineers.[1] It was estimated that the annual repairs to all motor vehicles in the United States, due to neglected chassis lubrication,[2] totals at least 75 million dollars. On the other hand, it would cost about 500 million dollars a year to prevent these repairs by adequate lubrication of the chasses as now built—on the assumption that two hours per week per vehicle would be required, and that labor would be worth at least 50 cents an hour. A vehicle owner's time certainly represents money whether he is paid for it or not. Bearing in mind that lubricating a chassis as ordinarily built is a dirty and disagreeable job, usually necessitating crawling under the car, a car owner is certainly justified in his neglect of these parts, for he saves money by refusing to be bothered. The assertion was also made that chasses could be so built that the time required of an operator to properly lubricate it would be reduced to less than one twentieth of the time now necessary.

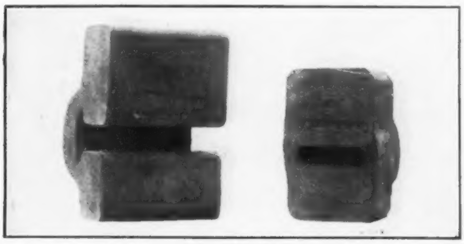


Fig. 1.—Rubber blocks used on the Mack Bus in place of spring shackles.

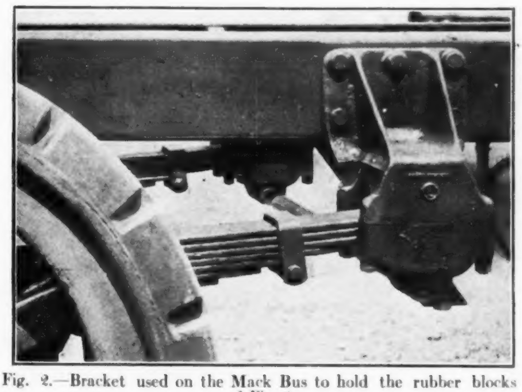


Fig. 2.—Bracket used on the Mack Bus to hold the rubber blocks of Fig. 1.

1) A paper on "Chassis Lubrication" by Cornelius T. Myers.
2) Results of neglecting Motor Vehicle Lubrication were illustrated and discussed in LUBRICATION, March 1921.

This suggests that the negligence of car users is a justifiable result of insufficient consideration of details of design by automobile manufacturers. As this subject becomes more thoroughly understood, it is gradually being taken care of. Designers have been so occupied up to the present with the larger mechanical parts of a vehicle, such as the engine and transmission system, that chassis lubrication has apparently been given scant study. Now that the larger parts are fairly well standardized, attention is being turned to the small parts, the lubrication of which forms the substance of this article.

Fig. 3.—The Belflex shackle of rubberized fabric.

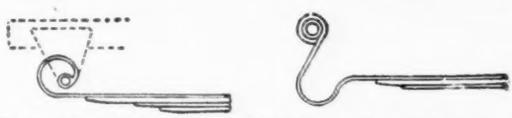


Fig. 4.—Types of chassis springs with rigid connections which eliminate the shackle bolt and its friction surfaces.

Elimination of Rubbing Surfaces

One of the most interesting solutions of the time required to lubricate chassis parts is to eliminate the parts requiring lubrication. A few of the many possible means to this end are

shown here as suggestions of what can be done. In the Mack bus, rubber block attachments of springs to the frame have been developed in place of shackle bolts. The Belflex rubberized fabric shackle is another interesting means of eliminating the bothersome shackle bolt, the principle being similar to replacing metallic universal joints with rubberized fabric universals. In Fig. 4 is shown still another means of eliminating spring shackle bolts, flexibility being secured by springiness of the ends of one spring leaf. Many other means can be used to secure the same end, among which Fig. 5 is suggestive. All these contrivances for shackle bolts can, of course, be eliminated in turn by the use of quarter eliptic springs.

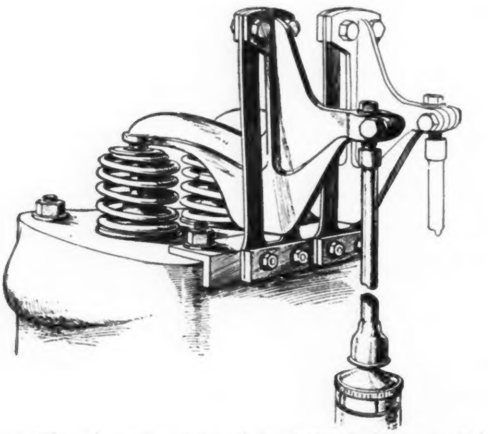


Fig. 5.—The valve rocker design of the Straker-Squire truck which eliminates rubbing surfaces.

"Oil-less" Bushings

Where it is considered impossible or impracticable to eliminate rubbing surfaces the question of lubricating some of the lightly loaded chassis parts is simplified by the use of "self-oiling" bushings, which may be of cast bronze with graphite inserts, or hardwood impregnated with oil. They are very satisfactory for oscillating or intermittently rotated bearings carrying light loads, if they are protected from dust and moisture as in the clutch pilot bearing and sliding sleeve, steering gear post tube, etc.

"Self-lubricated bushings do not stand up for any satisfactory length of time under heavy or steady loads, especially where they are exposed to dirt and moisture. When any wear has taken place atmospheric moisture can

Fig. 6.—The Romon lubricator, with a gang of individual pumps, each one of which forces oil through suitable tubing to some chassis friction surface. It is usually located with the handle near the driver's seat, where it is easily reached when oil is desired.

enter and oxidize the pin, the oxide later being rubbed off and held by the bushing. The bushing then becomes a lap and begins to eat into the pin or shaft."[1]

Self-Contained Oiling Systems

The lubrication of engines has been given careful and constant attention until very reliable systems have been developed. Gear

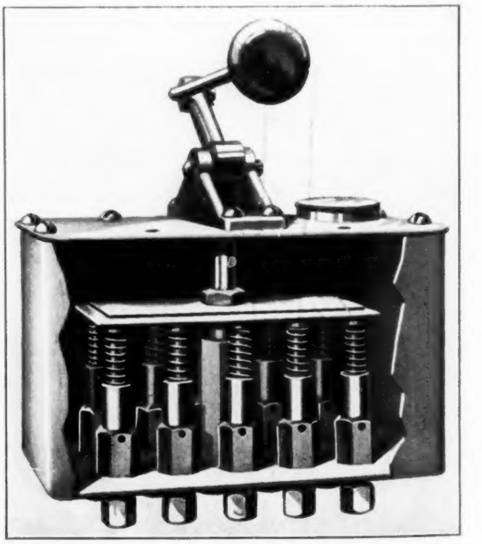


Fig. 7.—The Manzel lubricator is quite similar to that of Fig. 6, though it is usually located back of the dash board with the handle projecting through.

boxes and rear axle gearing have been carefully worked out, "so that, under ordinary conditions, two fillings with moderately heavy oil per year will suffice for satisfactory service. The lubricating method in the latter instances is that of retention of lubricant and exclusion of dirt, to which method the design and operation of these parts lend themselves. This also applies to wheel hubs, and might be extended to universal joints, steering-gear housings and

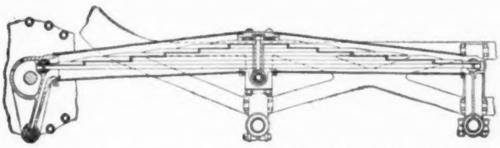


Fig. 8.—*Fergus* cantilever spring enclosed in a boot and provided with oil channels for a regular system of oil circulation.

some types of fan mountings."[1] For the more exposed parts a non-circulating system has been worked out by Romon and Manzel. This is a thorough and elaborate attempt to properly lubricate the chassis parts from a single point, where a reservoir containing two or three quarts supplies oil to a dozen or so independent plunger pumps. Two lubricators of this type

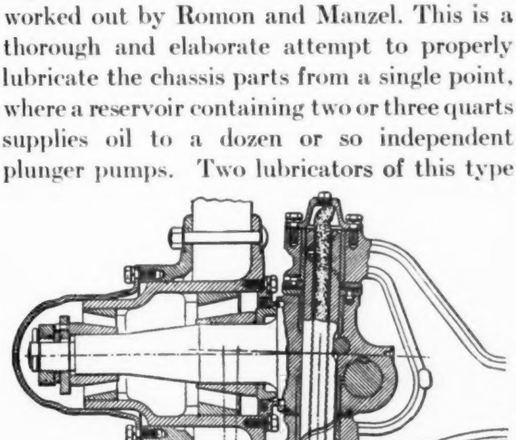


Fig. 9.—Wick lubrication of knuckle pin bearings on Class B war truck

are shown in Figs. 6 and 7. A pipe from each plunger feeds the various chassis bearings. "Once a day or oftener if thought necessary, the driver of the vehicle operates the hand lever a number of times, forcing clean oil to every bearing that has a pipe connection. Whether the flexible connections to front and rear axles will stand up under continued vibration is yet to be demonstrated, while the complex piping makes a repair job awkward and reduces accessibility. The system has great merit from the owner's standpoint, as it is handy and clean to operate."[1] The Fergus automobile makes use of a somewhat similar system except that oil

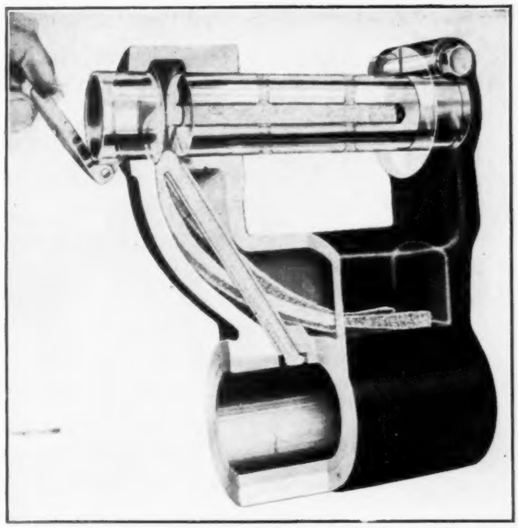


Fig. 10.—The Myers Magazine Oiling System applied to the spring shackle of the Ward La France truck. Oil is fed from the reservoir by wicks to both upper and lower bearings.

is supplied from the engine. Fig. 8 shows how the springs of this car are enclosed so that a spring and its shackles are lubricated as a unit from the central system.

"Wick oiling of spring bolts has recognized advantages. The Franklin car for a number

Fig. 11.—The layer of dried mud on this steering knuckle and front wheel hub shows how grit gets into bearings unless prevented from doing so by suitable felt washers or an ample supply of grease. An Oil-Kipp is used in this instance for lubricating the knuckle pin.

of years has been equipped with hollow spring bolts into which dipped wicks that lead to the bearing surface of the bolts. The clutch and brake controls of the Franklin car are also equipped with wick oiling devices, and the Lippard-Stewart light truck provided lubrication for clutch and brake controls by wicks in hollow shafts and by magazine oiling brackets."[1]

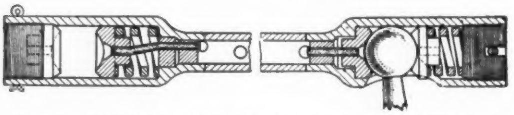


Fig. 12.—Drag link lubricated by wicks from oil contained in it.

The Class "B" military trucks built by the U.S. Government during the war, lubricated all spring shackles by the Myers Magazine Oiling System. This system, which was first used on the Fageol trucks in 1916, and is shown in Fig. 10, "employs hollow brackets, shackles, etc., holding ½ and 1½ pints of oil, which lasts 30 to 90 days. This oil is automatically fed, in small but sufficient amount, to the various pins, shafts and bearings by means of capillary attraction and surface tension. Felt wicks reach from the bottom of the oil cavities or magazines to the tops of tubes or drilled holes down which they pass to the bearing to be lubricated. This prevents excessive feed or loss of oil by gravity or splash, and the wicks act as filters as

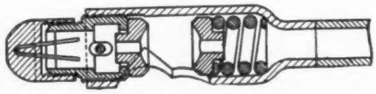


Fig. 13.—Grease cup incorporated in a drag link end.

well as feeds. Several magazines can be piped to one accessible filling point, and 15 minutes once in two months should be sufficient to give thorough chassis lubrication.

"Drag links for the steering mechanism made by the Cincinnati Ball Crank Company are arranged so that they can be filled with oil and fed by wicks through the ball sockets to the ball connections at either end of the drag link,"[1] as shown in Fig. 12. In Fig. 13 is shown another drag link design altered to incorporate a grease cup.

Any of these systems feeding oil by capillarity or gravity become inoperative at temperatures when the oil used congeals. Consequently it is important during cold weather to use oils which remain fluid at all temperatures likely to be encountered, though failure to do so will not be immediately apparent.

A suggested expedient is to use discarded lubricating oil from the engine, which usually contains enough fuel to lower its "pour point" a little. The felt wicks will filter out any gritty sediment.

Lubricating Devices for Chasses Now in Use

All the devices enumerated so far are really applicable only to chasses when they are manufactured. For the millions of chasses already in users' hands it is costly if not impracticable to make alterations involving completely satis-

Fig. 14.—The *Amco Grease Gun* with flexible armored hose and check valve nipple. A chuck-like coupling fits over the nipples fitted to various chassis parts requiring lubrication, and is secured by a quarter turn. A special piston is used so that it is claimed the gun can be filled by suction.

factory lubricating systems. There are, however, many oil cups and greasing devices that are easy to apply, which are a great improvement over the chasses as sold. In the field of these proprietary devices there is a strong difference of opinion as to whether grease or oil is a superior lubricant for chasses, though it seems to be conceded that oil is the better. Since oil flows under the influence of gravity, a continuous supply to the rubbing surfaces can be relied upon as long as there is oil in the reservoir from which it is fed. This very feature, however, has its handicaps, for unless

Fig. 15.—The *Dot Grease or Oil Gun* which locks in place over the nipples fitted to parts requiring lubrication, by a quarter turn. It can be attached and used with one hand. An automatic valve closes the gun when not in use, thus preventing leakage. The nipples have ball check valves and are normally covered by dust caps.

particular precautions are taken, oil will continue to feed when the vehicle is at rest, and run over chassis parts as well as drip on the garage floor. In this respect grease certainly has advantages, for it will remain on surfaces until rubbed off, and can be fed to the point required without regard for the action of gravity. Furthermore dirt and moisture will be sealed from entering bearings filled with grease, and a fresh supply of clean grease to the inside of the bearing is effective in removing foreign matter which may have gotten in at the outer ends. But the removal of old grease of an inferior quality which may have dried and hardened, is not so satisfactory, for while it is easily displaced from the slack side of a bushing if sufficient pressure is exerted, there is no assurance and little likelihood of its being dislodged from the spaces adjacent to the rubbing surfaces where fresh grease is most needed.

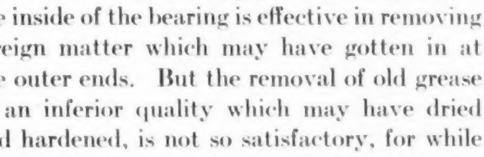


Fig. 16.—The grease filler used with the Dot Gun. It cuts a charge from a grease pail, and the slider makes transferring the grease to the gun a simple operation.

Thus, the presence of fresh grease at the ends of a bearing when new grease is forced in, is not a proof of the presence of fresh grease on the rubbing surfaces. Furthermore, since grease lacks the capillary action of oil, it fails to return by itself when once rubbed off, and consequently it must be forced in by frequent applications which are usually neglected. Also, the grease pail as ordinarily used collects all manner of dirt and grit which is eventually carried into the bearings when the grease is used.

A considerable step in advance over the customary "makeshift" grease cup, is the Searing Cup, which uses small paper cartridges of grease which slip into the cup and assure the use of clean grease. A thumb screw back of a piston attached to the cap makes it possible to force the grease in with considerable pressure. This feature is similar to several very effective grease guns which have been placed on the market during the last few years, such as the Alemite, Amco, Dot, etc. These systems "are used by a large number of concerns building passenger cars and trucks. They provide a much handier and more effective way of applying grease than by means of grease cups, and have the additional merit of being comparatively inexpensive to install, even on cars in service. They have most of the failings of the older methods, however; for handling a grease container around the average chassis is always a dirty job. The fittings sooner or later accumulate dirt which is forced into the bearings.

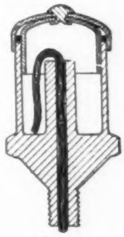


Fig. 17

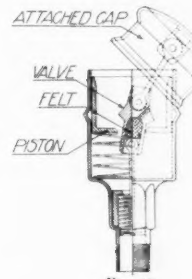


Fig. 18

Fig. 17.—*Bowen Wick Oil Cup.*

Fig. 18.—The *Felix Oil Cup* shown with the cap displaced for filling. When the cap is replaced the lower spring first draws the "Valve" against its seat on the floating "Piston" and then subjects the entrapped oil to momentary pressure. Normally oil filters slowly through a by-pass and felt in the "Valve."

When the fittings are not closed with caps, dirt and water from the washing hose will enter them. The number of times per month that individual attention is necessary is still excessive. On such parts as wheel hubs, universal joints and radiator fans, which with difficulty retain oil and have a reservoir for a considerable amount of grease, this system is very satisfactory.

"A modification of the grease gun system

Fig. 19

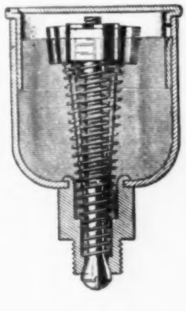


Fig. 20

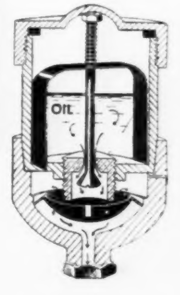


Fig. 21

Fig. 19.—The *Blooming Oil Cup.* When filled to the brim quickly drains to the top of the standpipe, giving a preliminary flushing of oil to the bearing. In operation, the motion of the car splashes oil to the conical cap from which it drains into the standpipe. As the oil level lowers, it is claimed to splash more violently, thus continuing its action until very little is left. No oil is fed when the car is at rest.

Fig. 20.—The *Vibra Oil Cup* feeds oil only when vibration of the vehicle moves the inertia weight attached to its valve.

Fig. 21.—The "*Vanoiler*" by means of the students' lamp principle, maintains a constant oil level in a splash basin, from which oil flows only when splashed by motion of the vehicle. The oil level in this basin is adjustable, which makes the rate of lubrication adjustable also. When the cap is removed for filling the reservoir, a spring closes a valve to the splash basin so that oil will not flow when air enters the reservoir.

calls for an air-tight grease pail to which pressure can be applied by a tire pump, and the grease forced through a flexible tube to the various fittings. This eliminates the filling of the grease gun and protects the grease from dirt—a very desirable feature."[2]

Oil cup devices to be successful must provide some means whereby the oil flow will be very restricted. Several designs make use of wicks

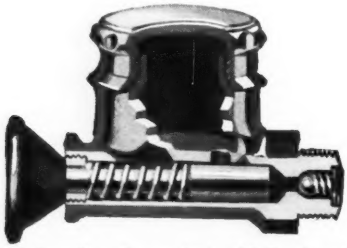


Fig. 22.—Madison-Kipp Corporation's "*Oil-Kipp*" combines an oil reservoir with a spring operated plunger pump. To supply a bearing with a "shot" of oil, the plunger handle is pulled out and released. Considerable pressure is developed by the spring.

to feed only a few drops a day, like the Bowen, Felix, etc. Another class of design operates on the principle of feeding oil only when the vehicle is in motion, in other words only when oil is wanted, such as the Blooming Cup, the Vanoiler, the Vibra Cup, etc. All these devices require attention only every few weeks.

Other devices supply oil only when given attention, such as Oil-Kipp and the Romon.

"There has been some argument against the advisability of lubricating spring leaves because it lessens the damping effect of interleaf friction; but spring makers put graphite between

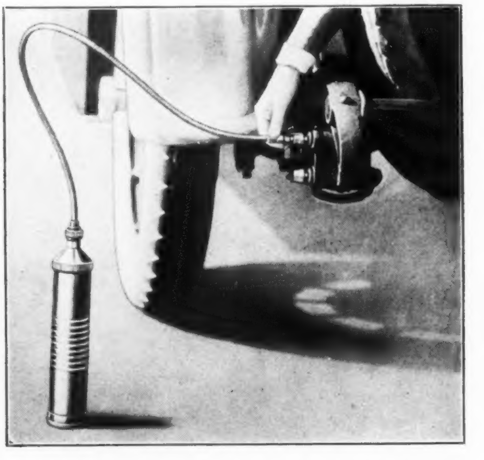


Fig. 23.—The *Romon Grease Lubricator* supplies grease under pressure from a compressed spring. A valve opens at the nipple when attached, allowing grease to flow until it is removed.

the leaves to cut down friction, and there is no doubt but that cars ride better when new than when the springs are old and rusty. Most instruction books state that springs should be taken apart once a year and re-graphited, and there are numerous devices on the market, evidently in response to a demand for such things, for applying oil to springs. Among them is the Sterling oil saturated felt pad held to the side of the spring. The Dilso system calls for cupped end spring leaves, each cup containing a small oil soaked felt pad. The Anderson boot provides a complete enclosure in which grease is packed."[1]

Conclusion

It is evident that details of chassis lubrication have been badly neglected in the past by manufacturers of motor vehicles, and that users can hardly be blamed for not giving the time necessary to keep their chasses properly lubricated.

Fig. 24.—The *Brown Spring Oiler* is a felt pad attached to a spring and saturated with oil which works between the spring leaves.

The importance of the subject is already appreciated by a few owners, however, and there are many devices now marketed which may be applied to vehicles now in use, whereby the labor of chassis lubrication may be materially lessened. The prospective car purchaser will do well to see that the vehicle he buys has incorporated in its design features which will make it unnecessary to apply accessory lubricating devices himself. There are manufacturers who are attending to these details to some extent either by eliminating some of the parts requiring lubrication, or by using devices which materially reduce the time necessary to properly attend to them. Other manufacturers will probably follow suit when they see that the public appreciates the resulting advantages.

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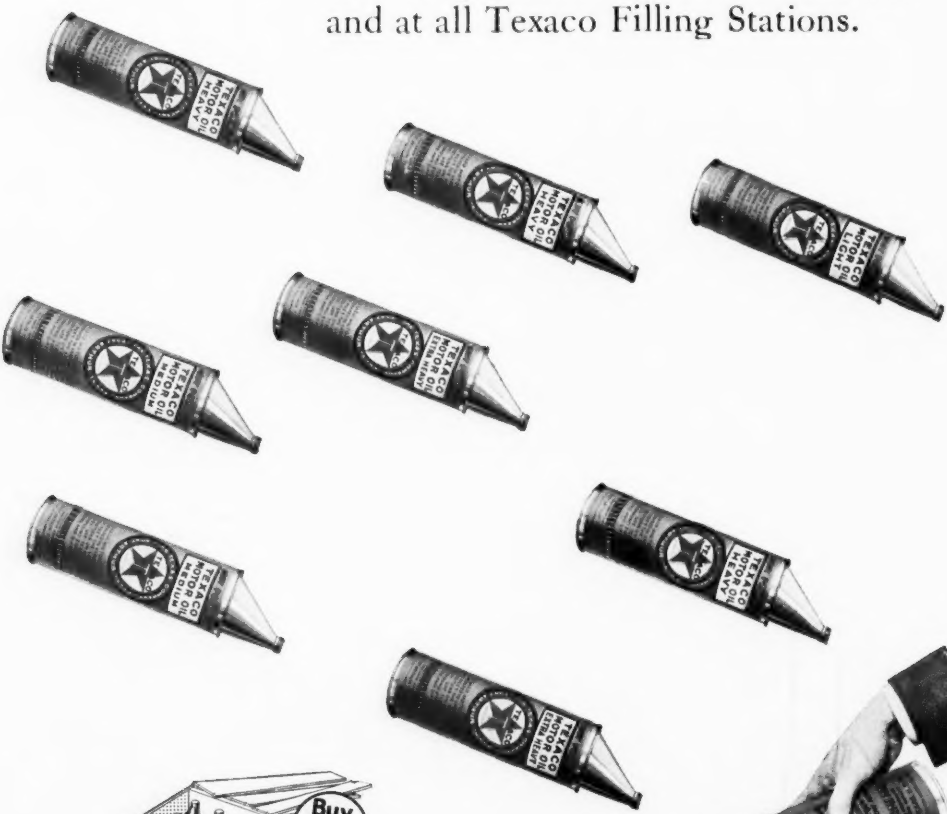

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